The “User Interface Standard” proposition

- Lighting energy use is determined in part by instructions from user.
- Ability of user to convey instructions to lighting controls relies on communication.
- Communication requires a common language.

Therefore
- Lighting energy use can be reduced with common language for controls.

Components of UI Standard

- Visual elements
  - Terms
  - Symbols
  - Colors
- Dynamic content
  - Indication
  - Actuation
- Audio elements
  - Sounds
  - Words
- Tactile elements
  - Identification
  - Actuation
- Concepts
  - “collections of meaning”
- Appear in hardware, software, documentation, culture
Standards Symbols

- Tape transport
  - since generalized to any medium

Underlying concept: linear representation of medium

User Interfaces

- Standard Interface elements common throughout daily life
- Key to safety, ease of use, efficiency
- Many use graphics, color, location, etc. to improve functionality and reduce language-dependence
- Commonality limited to comprehension needs
- Can deviate from standards when there is a good reason

User Interface Standards

- Types of UI Standards
  - Symbols
  - Indicators
  - Actuation
  - UI design principles
- Integrated UI standards
  - IEEE 1621: Power control
  - SAE J2402: Automobile dashboard elements
  - Surface Vehicle Standard, Road Vehicles —Symbols for Controls, Indicators, and Tell-tales

UI Standard Concept — Restated

- If User Interface elements — arrangement are clear — consistent
then maximize chances of optimal matching of user desires with service delivered

- Consistent >> clear
- Should be global

Key Elements of IEEE 1621 – Power Control

- 3 Basic Power States: On, Sleep, Off...
- … with standard colors: Green, Amber, Off
- Key symbols: Power; Sleep
- Sleep Metaphor ("wake up")
- “Hibernate” a form of Off
- Metaphors / Concepts are key to managing complexity

Power control elements
Symbols

- Derived from objects
- Learned

Symbols — Combinations

- More complicated concepts combine two or more symbols

Symbols — Use of letters, words

- Gear shift letters and numbers

P D R N

(ABS)  i  AUTO

What we found

- No existing standard on lighting control user interfaces specifically
- Many standards that inform UIs generally
  - Indicators, actuators, man-machine interaction principles
- Some relevant symbols
  - Common content
    - Elements for multiple end uses (and non-energy)
- Existing controls
  - Over 40% had no visual cues (beyond mechanical construction)
    - Remain opaque even when features added
    - Words use about 3x as often as symbols

Some of my switches

Standard symbols

- Organizations: ISO, IEC, SAE
- General lighting and variable control

\[\text{Sun, Moon, Cloud, Wind} \]

- Common content
  - General user interface symbols
  - Scheduling, time

\[\text{Clock, Calendar, Calendar, calendar} \]
Concepts in lighting

- Lighting in General
  - the overall concept of lighting
- Switching
  - basic turning on and off of a light source
- Dimming / Brightness
  - adjusting luminance
- Schedule / Timer
  - control by time of day, or time since actuation
- Dynamic Control
  - controls that automatically change light in response to sensors (occupancy, daylight) or other information
- Color
  - determining specific color of light
- Scenes
  - presets for groups of fixtures

Next steps

- Establish consensus for need for Lighting Control User Interface standard
  - Policy
  - Industry
- Expand survey to global products, standards
- Consider accessibility (disabled, elderly, young, …)
- Develop draft content
- Plan for periodic expansions
- Identify standards organizations
  - US: NEMA?
  - Global: CIE? JTC1?

Possible initial content

(Not part of project)

- Standard symbols
  - Lighting in general
  - Occupancy sensor
  - Daylight sensor
  - Dimming
- Interaction
  - "Up = On - Down = Off"
- Sensor indications
  - Colors
  - Flashing

Summary

- User Interface Standard concept is compelling
  - Existing examples show success, need
- No fundamental barrier to creating one for lighting
- Let’s do it!